

REMARKS

Claims 1-7, and 13-24 are all the claims presently pending in the application. Claims 1-7 are amended to more clearly define the invention, claims 8-12 are canceled, and claims 13-24 are added. Claims 1, and 13 are independent.

These amendments are made only to more particularly point out the invention for the Examiner and not for narrowing the scope of the claims or for any reason related to a statutory requirement for patentability.

Applicants also note that, notwithstanding any claim amendments herein or later during prosecution, Applicant's intent is to encompass equivalents of all claim elements.

Claims 1-7 stand rejected under 35 U.S.C. § 102(e) as being anticipated by the Munakata reference.

This rejection is respectfully traversed in the following discussion.

I. THE CLAIMED INVENTION

A first exemplary embodiment of the claimed invention, as defined by independent claim 1, is directed to an active-matrix addressed reflective liquid crystal display that includes a first substrate that is transparent, a second substrate, a lower insulation film formed on the second substrate, a plurality of switching elements, respectively provided for each pixel, an insulation layer having a surface irregularly configured, a reflection film formed on the insulation layer and having an irregularly configured surface depending on the irregular surface of the insulation layer, a liquid crystal layer provided between the first substrate and the reflection film, an upper

electrode being provided for each pixel and located in a region wherein the reflection film is provided, the upper electrode being electrically coupled to a source electrode of the switching element, and a lower electrode provided between the second substrate and the lower insulation film. The lower electrode forms a storage capacitor with the upper electrode.

A second exemplary embodiment of the claimed invention, as defined by independent claim 13, is directed to an active matrix addressed reflective liquid crystal display that includes a first substrate, a lower electrode over the first substrate, a lower insulation film over the lower electrode, an upper electrode over the lower insulation film to form a storage capacitor with the lower electrode, an insulation layer over the upper electrode and having an irregular surface, a reflective electrode over the insulation layer and having an irregular surface that corresponds to the irregular surface of the insulation layer, a switching element on the first substrate having a source electrode electrically coupled to the upper electrode, a second substrate above the reflective electrode, and liquid crystal material between the reflective electrode and the second substrate.

Conventional reflective liquid crystal displays are produced by applying a photosensitive insulation layer 28 (Fig. 2E) that is exposed to light in a photolithography process to form projections 29 (Fig. 2F). However, the amount of time that is required to expose the photosensitive insulation layer 28 is lengthy, which renders the fabrication process complicated and which undesirably increases the time for the overall fabrication of the display.

Further, the storage capacitance for each pixel in these conventional displays is small, and, thus, the display is susceptible to flicker. One attempt to address this problem has involved

increasing the overlap between the gate line areas and the reflective electrodes (pixel electrodes). However, even with this modification, the thickness of the first insulation layer 10 and the second insulation layer 11 (Fig. 1) is too thick to enable a sufficient storage capacitance.

Lastly, the projections 29 (Fig. 2G) are independently formed on the gate insulation layer. Therefore, the projections 29 are liable to be peeled off from the gate insulation layer 22 during subsequent processing.

In stark contrast, the present invention provides two electrodes that are parallel to each other and the liquid crystal layer. One of the two electrodes is electrically coupled to a source electrode of a switching element. In this manner, the two electrodes form a storage capacitor.

Further, in an exemplary embodiment, one of these two electrodes is reflective, which reflects the photolithographic light that processes the organic layer that forms the projections and, as a result, reduces the amount of time that is required for the photolithographic process.

II. THE 35 U.S.C. § 112, SECOND PARAGRAPH REJECTION

The Examiner alleges that claims 1-7 is indefinite. While Applicants submit that such would be clear to one of ordinary skill in the art taking the present Application as a whole, to speed prosecution claims 1 and 2 have been amended in accordance with Examiner Ton's very helpful suggestions.

In view of the foregoing, the Examiner is respectfully requested to withdraw this rejection.

III. THE PRIOR ART REJECTION

Regarding the rejection of claims 1-7, the Examiner alleges that the Munakata reference teaches the claimed invention. Applicants submit, however, that there are elements of the claimed invention which are neither taught nor suggested by the Munakata reference.

The Munakata reference does not teach or suggest the features of the present invention including an upper electrode electrically connected to the source electrode of the switching element (claims 1 and 13). As explained above, this feature is important for the upper electrode and the lower electrode to provide a storage capacitance that is sufficient to prevent flicker.

The Examiner alleges that the pixel electrode 11 that is disclosed by the Munakata reference corresponds to the claimed upper electrode.

However, contrary to the Examiner's allegation, the pixel electrode 11 that is disclosed by the Munakata reference is more analogous to the reflective electrode that is recited by the independent claims. Indeed, the pixel electrode 11 does not form a storage capacitor with any lower electrode. Therefore, the pixel electrode 11 does not correspond to the claimed upper electrode of a storage capacitor.

Further, contrary to the Examiner's allegations the pixel electrode 11 is not electrically coupled to a source electrode of a switching element. Rather, "[t]he pixel electrode 11 is electrically coupled to the drain electrode 22 by the intermediate electrode 12a and the light reflection layer 9." (Emphasis added, col. 6, lines 42-45).

Moreover, in further contrast to the present invention, the Munakata reference discloses forming an auxiliary capacitor Cs using the same structure as the thin film transistor 8 (Fig. 1A

and col. 6, lines 45-49). Thus, the Munakata reference does not teach or suggest that the pixel electrode 11 forms a portion of a storage capacitor. Rather, the Munakata reference discloses a storage capacitor C_s , which is entirely separate from the pixel electrode 11.

Further, the Munakata reference does not teach or suggest connecting either electrode of the auxiliary capacitor C_s to the source electrode 21 of the thin film transistor 8.

Lastly, the Munakata reference is not even concerned with addressing the same problems that are solved by the present invention. Indeed, the display that is disclosed by the Munakata reference is subject to the same problems that are solved by the present invention.

As is clearly illustrated by Figures 2B and 2C of the Munakata reference, there is no reflective surface below the photosensitive film 9a. Therefore, the amount of time that is required to expose the photosensitive film 9a of Fig. 2B is lengthy, which renders the fabrication process complicated and which undesirably increases the time for the overall fabrication of the display.

This problem is not addressed, nor even discussed by the Munakata reference. In stark contrast, the present invention provides an upper electrode below the insulation layer which reflects the exposing light and reduces the amount of time that is required for the photolithographic process.

Further, contrary to the Examiner's allegations the Munakata reference does not teach or suggest the irregular surface comprising a plurality of linear projections.

Rather, the Munakata reference clearly discloses that the resin film 9a comprises "discrete columnar shapes" (col. 7, lines 33-34) from which it is not possible to create linear projections.

The Examiner refers to Fig 1A in an attempt to support the Examiner's allegation that the Munakata reference discloses linear projections. However, Fig. 1A is a cross-section view from which it is not possible to discern whether the projections are linear. Indeed, the cross-sections of the projections that are shown in Fig. 1A of the Munakata reference appear to be the same as the cross-sections of the projections 10 shown in Fig. 1 of the present application.

The Munakata reference does not teach or suggest an irregular surface comprising a plurality of linear projections.

In summary, contrary to the Examiner's allegations, the Munakata reference does not teach or suggest the features of the present invention including an upper electrode being electrically coupled to a source electrode of a switching element and linear projections.

Therefore, the Munakata reference does not teach or suggest each and every element of the claimed invention. Therefore, the Examiner is respectfully requested to withdraw this rejection of claims 1-7.

IV. FORMAL MATTERS AND CONCLUSION

In view of the foregoing amendments and remarks, Applicants respectfully submit that claims 1-7, and 13-24, all the claims presently pending in the Application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

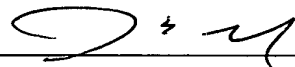
Should the Examiner find the Application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to

discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

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